CHRIST

(DEEMED TO BE UNIVERSITY)

BANGALORE · INDIA

A Project Report on

Physician Dashboard is created

Submitted in partial fulfillment of the requirements for the degree of

BACHELOR OF TECHNOLOGY

in

Information and Technology

by

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Under the Guidance of

Mr. Michael Moses T

and

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April-2020

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CERTIFICATE

This is to certify that **Aman Agasthya** has successfully completed the project work entitled "**Physician Dashboard is created**" in partial fulfillment for the award of **Bachelor of Technology** in **Information and Technology** during the year **2019-2020**.

Mr. Michael Moses T
Internal Guide

Saurabh Khare,Pallab
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Dr. K Balachandran
Head of Department

Dr. Iven Jose
Dean

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BONAFIDE CERTIFICATE

It is to certify that this project titled ”Physician Dashboard is created” is the bonafide work of

Name	Register Number
Aman Agasthya	1661050

Examiners [Name and Signature]

1.

2.

Name of the Candidate : Aman Agasthya

Register Number : 1661050

Date of Examination :

April 22, 2020

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Aman Agasthya (AA077497)** ("Intern") has undertaken internship project from our organization **Cerner Healthcare Solutions India Private Limited** ("Company") from **December 09, 2019** under the managerial guidance of **Binay JB (035043) (Team lead Senior Onboarding Partner)**.

During the internship, Intern has undertaken project "**Physician Dashboard using Mpage Fusion**" under the mentor guidance of **Pallab Chowdhury (Associate Senior Software Engineer)** and the project report is being submitted to **CHRIST (Deemed to be University): Faculty of Engineering** by **Aman Agasthya (1661050)** in partial fulfillment for awarding degree of **Bachelor of Technology in Computer Science and Engineering**

Yours sincerely,
For Cerner Healthcare Solutions India Private Limited,

Vivek Naik
Senior Manager, HR Service Center

For all future queries contact the HR Service Center with associate ID at https://hrservicecenter.cerner.com or utilize QR code for easy access. Please allow up to 72 business hours for a response.

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Acknowledgement

We would like to thank CHRIST (Deemed to be University)Vice Chancellor, **Dr. Rev. Fr. Abraham V M**, Pro Vice Chancellor,**Dr. Rev. Fr. Joseph C C**, Director of School of Engineering and Technology, **Dr. Rev. Fr. Benny Thomas** and the Dean **Dr. Iven Jose** for their kind patronage.

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We also extremely grateful to my guide, **Mr. Michael Moses T**, who has supported and helped to carry out the project. His constant monitoring and encouragement helped me keep up to the project schedule.

We also extremely grateful to my co-guide, **Saurabh Khare,Pallab**, who has supported and helped to carry out the project. His constant monitoring and encouragement helped me keep up to the project schedule.

If outside the college-mention the organisation and the concerned people, like head of the organisation, guide and any other person you want to thank. All faculty and non-teaching staff. You may acknowledge your parents or any who supported you.I thank my parents.

Declaration

We, Hereby declare that the Project titled "**Physician Dashboard is created**" is a record of original project work undertaken by us for the award of the degree of **Bachelor of Technology** in **Information and Technology**. We have completed this study under the supervision of **Mr. Michael Moses T**, Department of Computer Science and Engineering and **Saurabh Khare,Pallab**, Co-Guide Department.

We also declare that this project report has not been submitted for the award of any degree, diploma, associate ship, fellowship or other title anywhere else. It has not been sent for any publication or presentation purpose.

Place: School of Engineering and Technology, CHRIST (Deemed to be University), Bangalore
Date:

Name	Register Number	Signature
Aman Agasthya	1661050	

Abstract

A hospital consists of various section of workers and tracking the data related to them is extremely important. However, the data being recorded is still in the whole way of manual entry which could lead to a lot of confusion. Patient details should be handled carefully and by manual handle re assortment to such precious data could lead to either misuse or loss. For managing and maintaining the presence of the physician workforce of the hospital, Attendance is one of the most important and crucial functions in a work setting. Each patient being treated at the hospital is precious as its their life which is at stake and saving someone's life is the significant thing to do. All measures should be resorted to in order to look after the health and care of the patients. Another function that comes with Attendance is the dashboard management which is defined as an all-in-one platform that handles all physicians requests(checkups to be conducted on a patient),location of other physicians, accessibility while ensuring smooth functioning of their operations as well the prediction modal which helps with suggestion of the diseases the patient might be suffering with. The dashboard also keeps track of all the departments in the hospital and the doctors who are currently available. In lieu of this, an efficient system is proposed to solve the problem of the whole management of a hospital and all the workforce under it and management of critical patient details with prediction of disease. Therefore, in the following project,a physician management(dashboard) is developed entirely for a hospital which can manage all the physicians under them as well as the background details of the physicians. The project also deals with tracking the patient's health regularly by the data being updated as soon as being monitored by the doctor. The project also helps with the trail and error method being opted by the doctors so as to limit the diseases they should be focusing on by using the prediction modal being incorporated. This system also helps to automate the workflow, configure and manage leaves based on the hospital's requirements and specifications.

Contents

LIST OF FIGURES

GLOSSARY

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Technology	Description
MPage	It is a framework developed by Cerner using mithril js as the root component for development of it various products
CCL	Cerner Command Language
API	**A**pplication **p**program **I**nterface
Selenium	Platform for implementing graybox testing
Jasmine	Testing framework for javascript
ES6	EcmaScript 6

Chapter 1

INTRODUCTION

Every system or product is aimed at creating, improving and helping people in one way or another. But first, we need to identify the problems that come along with it.formulating a defined set of objectives which can later be implemented to develop an efficient and reliable product or system for anyone to use is also of utmost priority.

1.1 Problem Identification

For different private hospitals the basic details and tracking of the doctors are essential so as to have a better knowledge on the background of the doctor.Primary focus is also to bring into the knowledge of all the staffs and the patients the working hours of the doctor. Therefore, it is very important to have a reliable and secure dashboard to have the details of the doctors at one go. In many hospitals mostly government; the doctors who treat the patients are the final year students while the senior doctors are having an eagle eye's view on the patient which should not be the case. Doctors should be assigned directly by the management as well as their details should be made available to the patient's relatives Traditional approach that usually is being opted for in medical science for treatment is the hit n trial method. In this method the patients are given medicines on the basis of the symptoms they show. As the patient's heath improves or deteriorates on that basis the disease is being predicted which is very rational. Now a technology should be created which narrows down all the diseases which the patient might have. Then necessary steps must be taken. But at the end the problems being faced is the slow approach taken on the identification of the disease the patient is going through which again delays the process of treatment. The hospital also doesn't keep a

proper track of the doctors overseeing a particular case so as to reward them according to the critical rate of the case. The main cause of these problems is based on how the doctors are inattentive and how many cases have they resolved in a day that is the number of patients they have attended. The patients who are going through some major problems can be reviewed for further analysis in a much quicker way if a modern approach is being opted for. Similarly, in the case of leaves, if the doctors are working in different areas with respect to one hospital's branch, it is complex to assign patients to all of them as it is different for every area, site, city or state and the manager can get confused while managing it.
We discuss some of the causes in the following subsections.

1.1.1 Manual Attendance

Manual Attendance is a traditional system which requires the doctors to fill in their time sheets manually, for example- from 9:00 am to 5:00 pm on all days of the week which is a tedious task and wastes a lot of time. It is also the cause of many errors which arise due to the way the entries are made and how they are analyzed later. It also becomes a concern for the managers to maintain these records for all the doctors for a large period due to the wastage of time and resources. It is also quite difficult for the employers to keep track of the patients attended by respective doctors due to inefficient planning and administration.

1.1.2 Logging Report

A logging report, in attendance, represents a summarized report of the daily attendance logs of all the doctors in a specific area or hospital produced weekly or monthly as desired. This requires the manager or hospitals to analyze all the manual logs of different doctors and generate a cumulative report by making entries for each of them which is very time consuming and might still be incorrect due to improper understanding of the manual data. A separate leave report for all the doctors takes even more time and can get very confusing for the manager as well.

1.1.3 Manipulation of Data

One of the major risks in taking attendance of the hospital is the easy manipulation and duplication of the manual entries given by the doctors. For example, one person can make entries for many other doctors as well and the manager might not be able to notice it as the later analysis of the manual attendance sheet would show everyone is present, but it does lead to a decrease in the organization's productivity as 2 there is no proper way of verifying if the doctor is actually present or not. A similar case can be found in id recognition as a simple picture of the doctor can be used for attendance by someone else and there is no system to verify if the doctor is present or not. It can also cause confusion when the leaves taken by individual doctors is calculated. The proxy cases can be seen when in a government hospital where the students are asked to attend the patients while the main doctors are on leaves or may call the patients for treatment at their respective private clinic.

1.1.4 Handling the patients

Another one of the issues that doctors face with respect to patients is the handling of all the symptoms shown by the patients while he/she is being treated by the doctor and then the need to go through all the paper work and discussion being penned down manually in the notebook. The doctor needs to maintain a specific and organized format in which all the records are stored so that it can be later be accessed easily whenever needed. Suppose we take a scenario in which a new doctor of a hospital needs to see the night shift of the patient an data needed should be the current updated report which is only as of now is accessible by the previous doctor because he is the one who carried out the tests. This can lead to the wastage of a lot of time and resources as a separate group of tests need to be assigned to handle and organize all the manual data again of the same patient. Data can also be lost if the patient records needs to be transferred from one place to another and there is no proper planning or management to do it. Moreover, it becomes a bigger problem for the doctor when the data needs to manage for various sites in the city and there is no conventional and organized way of doing it.

1.1.5 Improper Security

Another challenge that hospital management faces with respect to data populated from patients tests is the proper verification of doctors or nurses while logging it. Manual logging is risky and can easily be manipulated or duplicated by other workers and is the least governable or controllable option. Other verification techniques include biometric and facial recognition which also possess drawbacks such as inaccuracy, violation of privacy, low reliability, time consuming and many others that must be taken care of. A secure system to implement data management must be focused on to make sure that the doctor morale is upheld and there is no decrease in accurate treatment by the hospital.

1.1.6 Reducing Complexity

While having a secure and efficient physician dashboard system for a doctor is top priority, we must also think in regard to the doctors and develop a simple and easy to-follow system for logging data that they can use and verify themselves without much complication. The more complex the system is, the harder it becomes for everyone to mark their respective patients details daily in a quick and efficient manner. The doctor must also follow a simple and fast technique with the most advantages to verify the patients so that not much time is wasted in logging the data or to check the how the patient is reacting to medicines or the treatment. The doctor must also ensure that a logging report is automatically generated by the system for the patients he/she is treating under his profile and on a daily basis the management can keep track of the patients being watched by the particular doctors.

1.2 Problem Formulation

In regards to the above issues and concerns, the main focus is to formulate a system that helps to manage all the doctors who comes under a hospital so as to check their respective activity and attendance along with the patients being taken care by each doctor with the update of the patients being handled and the data generated which can be accessed by the other doctors as well and to create a modal which predicts the disease that the patient might be having depending on the symptoms he/she displays.

1.3 Problem Statement & Objectives

After much planning and discussions on the various problems related to Physician and patient management system for different branches of a hospital, we intend to create a system that makes this process much more easier and scalable for all types of Physicians by providing all the necessary functions and operations in an all-in-one platform where the specific physician can easily access, analyze, manage, accept or terminate data for a patient and also can evaluate each of them based on their daily or hourly progress. Physicians can also keep a track of the leaves which they can apply for under this dashboard or the system. It must also be ensured that a specific calendar is designed for all the doctors working in different sites about the holidays given by the hospital management in a year irrespective of the leaves taken. Some of the objectives defined for the proposed system are:

• Elimination of manual collection of patient's data • Secure Verification of Every doctor and attendance. • Logging report for each patient • Efficient storage and organization • Easy-to-use dashboard for the doctors along with time-off. • Focus on Authenticity • Prediction of the disease • Easily customizable according to requirements • Additional option to manage overtime of doctors • Customizable Allocation of patients being attended • Interactive Dashboard

1.4 Limitations

Every project comes with its own set of advantages and disadvantages that the management should be aware of. Although every issue and problem is analyzed and discussed and a resultant system is planned with all the solutions integrated into it, there are some limitations that need to be known and understood without which the proposed system will not be able to function and operate at the optimum level. To completely eliminate the feature of manual data entry from the hospital, we have planned to create a dashboard for all the doctors through which they can login and add the patients whom they are treating as well as log in their attendance and can also check for the availability of certain colleagues. For this, it must be noted that the doctors must belong to the same organization and can only log in using the credentials provided by the hospital. Another limitation of the system requires the doctors adding the patient's information by themselves or any add on points which includes feeding the data into the respective patient

column like hemoglobin level or adding the image of the x-ray or MRI scan reports. Also, with our proposed system, it must be verified that each and every doctor is assigned to a particular site of the hospital(example- cardiology department) irrespective of what his/her role is because at the time of emergency when searching for availability of doctors from a particular department then his/her name should be displayed so as to get the patient help immediately. .

Chapter 2

RESEARCH METHODOLOGY

Research methodology is defined as a systematic study of defining a problem and formulating a hypothesis by collecting and analyzing data and information and making deductions and conclusions based on it. Research is often considered as a careful investigation or inquiry specifically through search for new facts in any branch of knowledge. Its main purpose is to inform action, to prove a theory, and contribute to developing knowledge in a field or study. In prior to developing any project or product,company firstly conducts a thorough research on demanded product its going to develop, whether or not it is scalable for all clients, how much will it benefit them; what are the advantages and shortcomings of existing systems One of main concern is how we can overcome them to create a more advanced, simple, interactive and easy-to-use system for both employers and employees. In our case, for blue-collar workforce, attendance and leave management is highly crucial as daily logs determine the weekly or monthly payroll for every individual employee. It is also important to research why creation of physician dashboard is considered a priority for any hospital and how it helps in increasing its productivity; and also helps to maintain smooth control flow of managing more than 1 patients at a time.Helping management to have a check on activities of doctors is also important. A complete research is also necessary to be aware of increasing need and demand for Physician dashboard and how hospital management people are facing complications in managing their workforce for a long period of time. We must also acknowledge how the dashboard not only helps the hospital in maintaining a stable work environment but also on how regular update on the status of the doctors list board helps the management maintain their work credibility and work history. During the planning of the specified project, we must also do a thorough research on what issues and concerns the hospitals face regarding attendance and how their existing attendance

systems are working and with what functions and options as well. We must also try to understand what drawbacks does current system of hospitals possess and how can they be overcomed to create a more efficient system. We must also have a detailed analysis of what technologies are being used to develop these systems and the technologies that we can use for developing our proposed system. We must also be aware of the architecture followed in implementing the project and how it helps in the performance and efficiency of the system. We must also focus on how to optimize proposed system and have a flexible and reliable platform for storing all the data of doctors in hospital as well as logs of the patients attended.

Chapter 3

LITERATURE SURVEY AND REVIEW

Developing a code for front facing client component is something that the company gives top most preference to and it has to go through many stages of development and testing by DevOps so as to get through the process efficently and quickly as well. Testing in a critical piece of each code development method to which organisations give broad time and exertion. The ever-changing industry needs of business require that specialists receive and bolster themselves to meet the necessities in unit testing, and during the time spent doing as such, contribute heightening to more current methodologies and fundamental systems of architecture in unit testing from the viewpoint of unit testing. The progression of Mpages framework is the consequence of such a movement to improve the development and transpiling quality and its effect can be seen as the component needs to support a variety of browsers as well with backward compatibility. Taking a shot at Mithril.js provides beneficial outcomes as a new component of our own can be developed which can provide unanimity to the whole organization as well. Cerner's main product which is called millenium is where the component gets integrated and can only be used there itself and no where else. Unlike other components like React Js where we can create a react file by just writing some meager lines of code is not applicable to Mpages Fusion Framework. It can only be run through either a cerner ID provided to the client or the developer.

3.1 Literature Collection & Segregation

We have to use a Software development technique to develop and test the actual outcome with the expected outcome. it can be achieved by writing development codes and test scripts and following the agile methodology. Test automation is used to automate regression testing tasks and other testing tasks which are very difficult and time consuming to perform manually but still tests are carried out by the developers side by side as they know their components better.It is time consuming but saves the later cost during the review and iteration process. Costs are really higher initially. It includes the cost of the tool, then the cost of the training the devOp for both development and testing which also takes quite a lot of time, as well as to maintain many servers for development and component development. But when the components are ready, they can be executed hundreds of times repeatedly with the same accuracy and consuming comparatively less time. This will save lot of money and time if the component turns out to be faulty since it is a healthcare domain more accuracy is required as someone's life is at stake as well. So the cost decreases, and ultimately it becomes a cost-effective method for software testing . Integration testing is done to test the components when integrated to verify that they work as expected i.e. to test the components which are working fine individually does not have issues when integrated. When considering in terms of testing large applications using black box testing technique, it involves the combination of many components which are coupled with each other very tightly. the Integration testing technique concepts can be applied for testing these types of scenarios. The individual components are first tested individually. Once the modules are unit tested, they are integrated one by one, till all the modules are integrated, to check the combinational behavior, and validate whether the requirements are implemented correctly or not.

3.2 Critical Review of Literature

We feel that the whole process of developing and testing the component at the same time is time is consuming,hectic and complex but this is a strategy which works most of the time for the company as a single person is hired instead of 2 people for development and testing separate; and since the developer knows their code better it will be easier for them to test their components as well.Even including integration testing in the process makes the process lengthy but a very common problem in development is that

many times a developer deploys the changes without unit testing it. Integration testing becomes important at that time.

Advantages

1. This testing makes sure that the integrated modules/components work properly.
2. Less workforce required.
3. Making use of Cerner exclusive software provides unanimity to the whole process.
4. Saves money and time during review process.

Disadvantages

1. Takes a lot of time to develop the component
2. Takes a lot of time to train the DevOp with company exclusive softwares.
3.Complex process for the Devops.

Chapter 4

ACTUAL WORK

After formulating, identifying and doing thorough research on the problem, the actual work project is taken up. We identified the problem in the existing and/or manual system of collecting data of the patients. There is no track of the data when the patient visits the hospital again which leads to untracked symptoms. The problem is not limited to this but it also extends itself in the areas of attendance logging, the patients not being treated properly, hit and trail method relied on identifying the disease of the patients, improper information about availability of doctor which leads to chaotic situations in the case of emergencies . We further identified the shortcomings with the leave management system of the doctors which were quite similar to the attendance problems but with addition of problems like handling unauthorized leaves, and other permutations of problems. The actual work was quickly taken up after identification. The actual work has been divided into the following sections:

- Methodology of the study or Planning
- System Architecture
- Experimental and/or analytical work completed in the project
- Prototype Development and Product Implementation

4.1 Methodology for the Study

As known by everyone in the software industry planning is the most important and time taking step of any project and hence in the company it was given a proper priority so that

nothing goes wrong further down the road. This planning phase can be further divided into the following phases.

4.1.1 Problem identification

This phase started right at the moment the problem was identified. In fact the problem identification, formulation and research regarding the same is the foundation of this very first basic step. This phase is aimed at creating a vision to ensure that the strategies are aligned properly and with everyone's understanding of the problem. To understand, identify and get everyone in the team on the same page regarding the problem multiple meetings and discussions were held. The meetings were documented and then re iterated to exactly identify the problem. After everyone's input, every member was on the same page and the problems were identified successfully. The phase of the meetings changed after identification and a goal was set to solve and rectify the problems identified.

4.1.2 Solutions and work-Around

After getting clarity about the problem and the end goal, iterative discussions and meetings were carried out to find the workaround or solutions to the problems listed and documented out in the previous phase. This led to the formation of the structure or model of the project. This was the detailed project planning phase which involved the maximum communication. The solutions which were found are but not limited to using react, angular for developing the entire UI but the main goal was to standardize the entire project with millennium, so we came up with the idea of using MPageFusion framework for development. To avoid manipulation of attendance, we resorted to idea of keep on having a track of the location of the doctor to be in the periphery of the hospital; doctors will be asked to fill in the details of their time sheet on their own and in case of doubts we can their locations recorded from time to time. All of the above solution ideas with other undisclosed ideas were taken into consideration to form a general structure/model of the product.

4.1.3 Designed Model of the Product

The clarity of the problem and its solutions was already achieved till this phase, the next which was required was a visual aid of all the artifacts and documents generated so far. Every document and artifact were taken and carefully arranged by the product design team to create a proper modeled up product. Sketches were achieved by the UI/UX team and were presented into the panel again for the overview. These interactive sketches gave us the gist of how the product will not only look and feel like but also how it will function. The fine impression of the sketches in our heads got us to focus upon the simplicity and intractability of the product as well. The designing of the sketches took place along with the previous phase for maximum efficiency. UI/UX team had a brief interaction with the management so the main goal was to achieve maximum features and less of animations. The product should be quick to load and should be efficient at the same time.

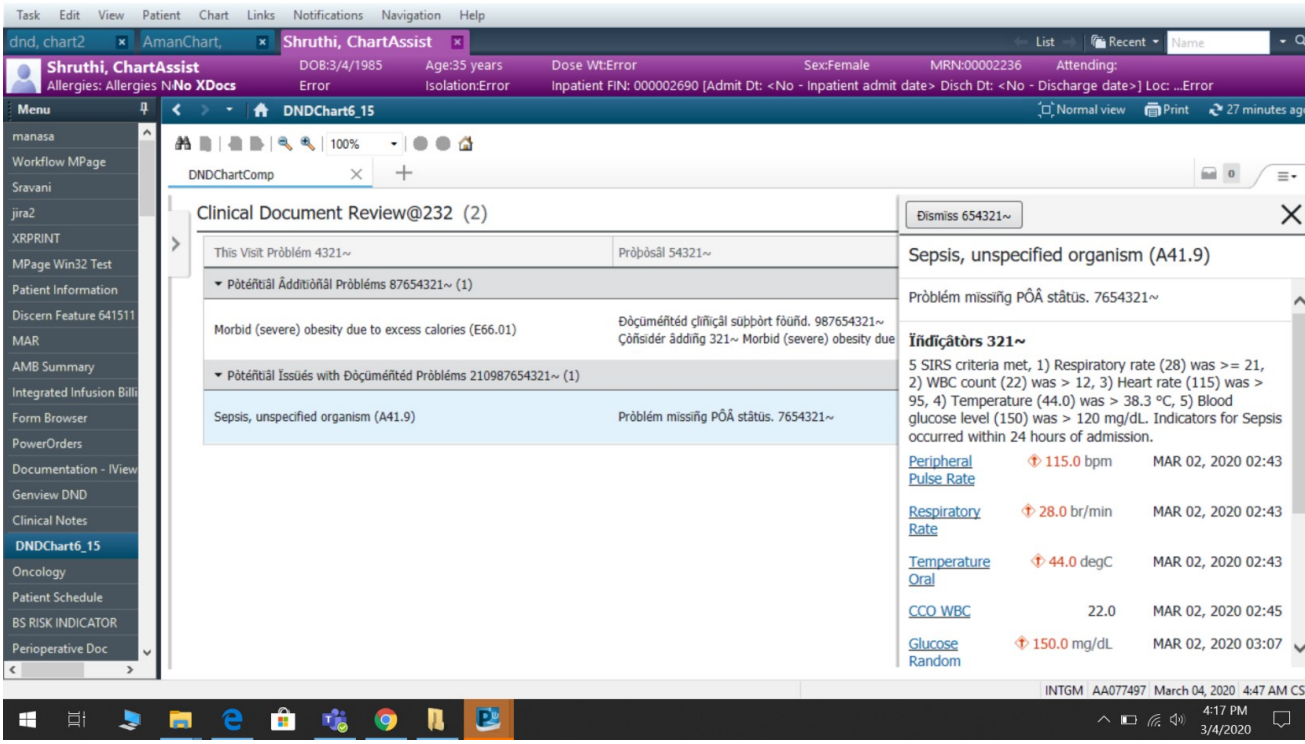


FIGURE 4.1: Design for the Dashboard

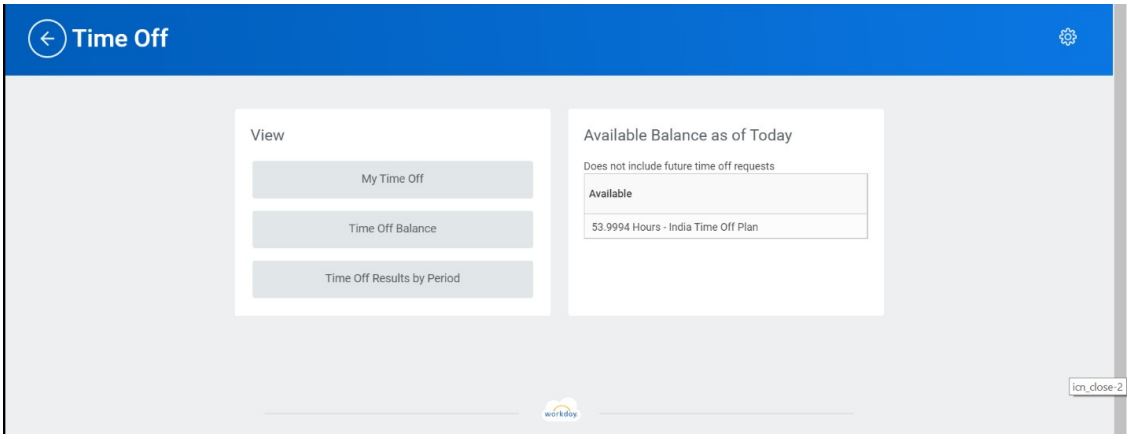


FIGURE 4.2: Time OFF section design

4.1.4 Discussion over Design

After the introduction of the interactive product sketches in the panel everyone had an image of how the product will function like, how users will use it and what problems they might run into or what are the shortcomings of the planned product. The undisclosed shortcomings were brought into the panel. Apart from discussions over the solutions of undisclosed shortcomings of the planned product, the product was nitpicked for perfection. This phase was reiterated with changes in interactive UI/UX sketches, meetings and discussions until everyone agreed. This phase was important since it helped us to discover the hidden dependencies. This phase also helped us in understanding age, time, cost, quality, changes, risk, and related issues. This phase further shaped the planned/already in works architecture at that time.

4.1.5 Discussion for the control flow

Right after finalization of how the product will work, function, look like and how it will interact, discussions for control flow started taking place with the manager of the Cerner Intelligence Org. This was important to minimize the idle time and optimize delivery period. It is like a guide or a blueprint for our team to refer to and build. This phase defined the team personals and their work to create the right valuable product. At this time it was clear that what technologies will be used to develop, test, communicate and deliver the product. It was planned how the machines of each personal will be configured. Research on the existing technologies in the company and new available

technology was done and technology vertices were finalized. How one vertical of the technology being used will communicate to another vertical was also discussed.

4.2 System Architecture

Like discussed in the previous section of the report a detailed model of the control flow was prepared. In the below paragraphs we will be discussing the technologies which were used for making the project and at the end we start with testing of the components developed.

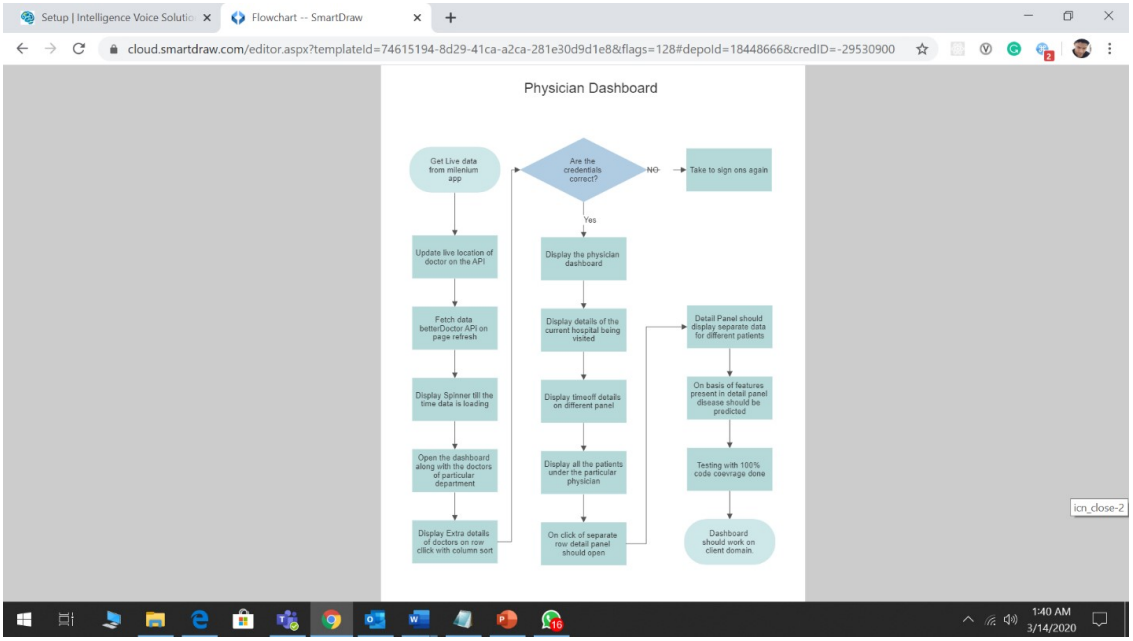


FIGURE 4.3: Flowchart of Main Architecture

4.2.1 MPageFusion framework

MPages Fusion is the code companion library for MPages views and components. It provides a combination of a virtual DOM, a standardized UI, and a library of responsive controls. The MPages Fusion library provides a pathway toward a consistent look and feel between MPages components and reduces the complexity of UI development. The UIComponent is the base class from which all visual components will inherit. It contains various lifecycle methods that are intended to be overwritten by the control

that is implementing a UIComponent. It also contains various helper functions when dealing with child UIComponents and handling events. The UIComponent class has explicit lifecycle methods that can be overridden or used to achieve the desired functionality of a particular control. There are four distinct sections in the UIComponent lifecycle. 1. Construction 2. Render 3. Update 4. Destruction The first cycle, construction, is where the UIComponent is given the opportunity to prepare itself for rendering. Construction lifecycle methods are called in the following sequence. 1. initialState() 2. initialProps() 3. beforeCreate() 4. createChildren() 5. propChangeHandlers() 6. dependentPropChangeHandlers() 7. afterCreate() We used the MPageFusion framework for the deployment of the UI as well.

As we can see in the figures given below Sample UI is being developed for displaying Doctor's Data

The second figure displays the current practice location of the doctors

The third figure shows the column sort functionality being applied

FIGURE 4.4: Sample UI design for displaying doctors present at hospital

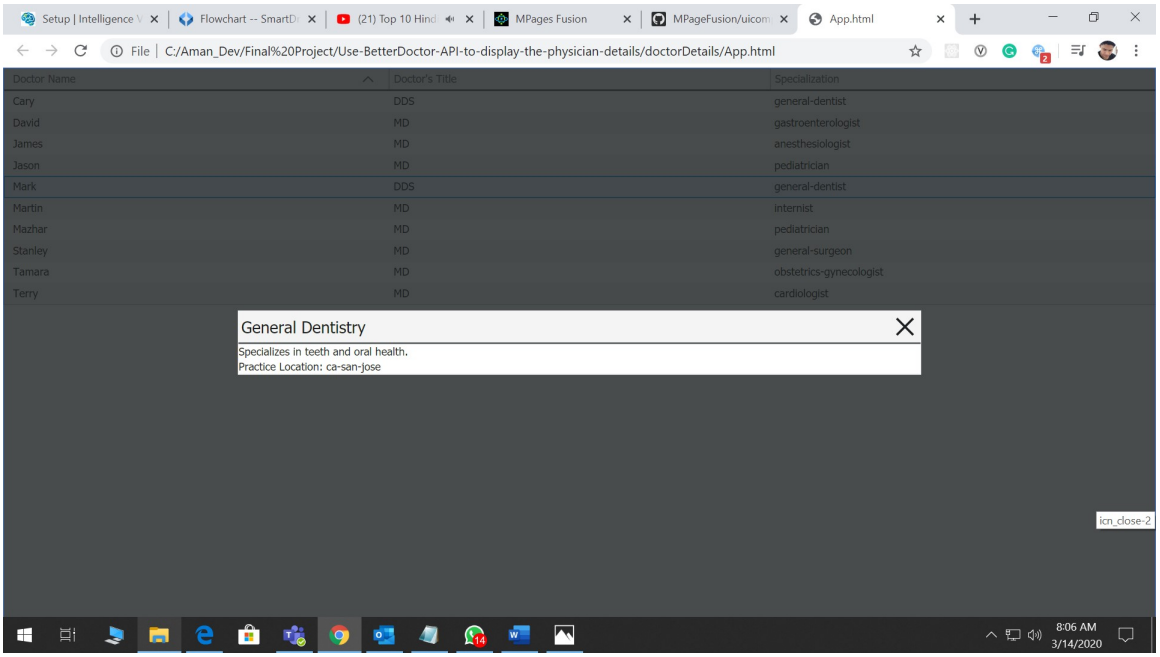


FIGURE 4.5: Current Practice location

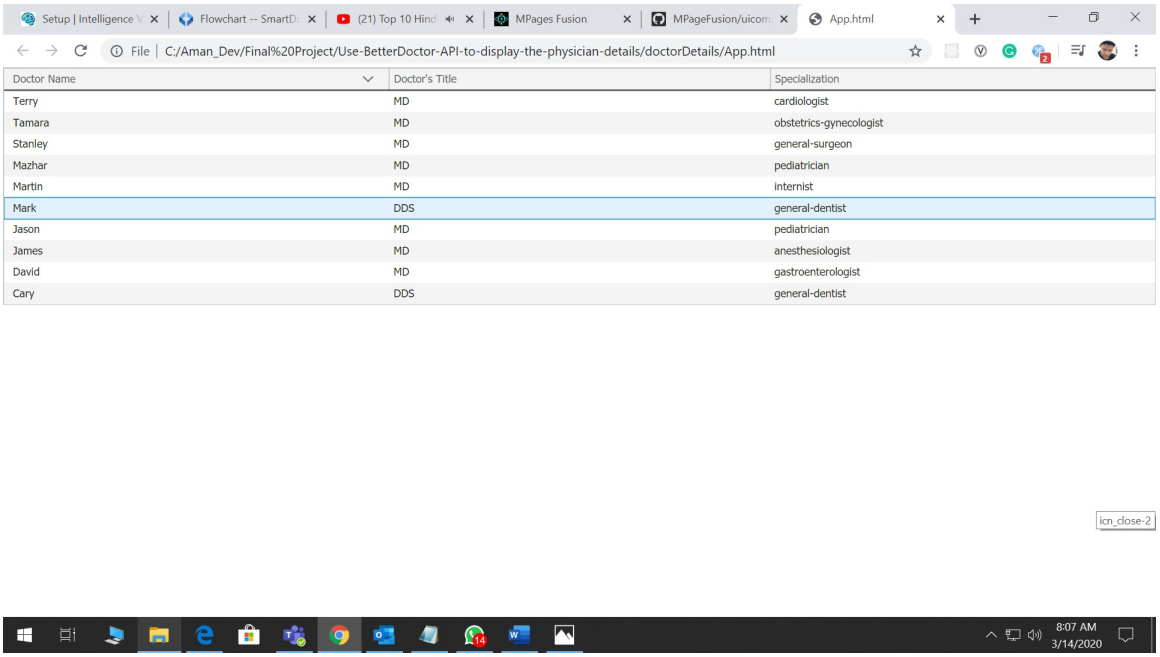


FIGURE 4.6: Column sort functionality added

4.2.2 TimeOff

Now the next step was to work on the functionality of generating the number of hours of time off that can be taken by the doctor after working for certain number of hours. There was no certainty in the number of hours that are being given by the doctor but the fixed number of hours were scaled to 8 hours everyday. So for eample if the doctor works for 100 hours in total then he/she can take a leave upto (0.2*100 = 2 hours) and the workday gets filled with the balance but just in case if the doctor takes leaves for more number of hours than available in the workday then he/she has to compensate for the rest as the time balance will go in negative.

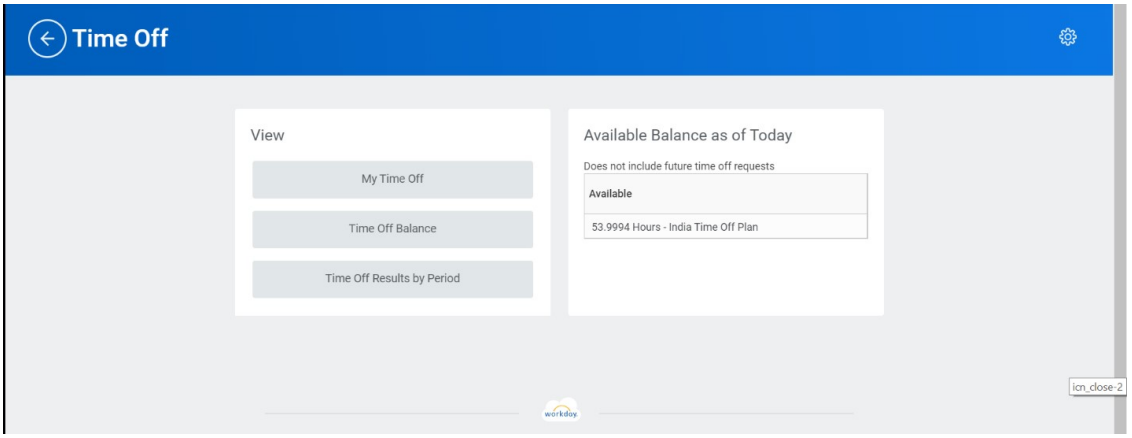


FIGURE 4.7: Time OFF section

4.2.3 Pre Requisites for the prediction

Before jumping into the next step where we have to predict the disease that the patient might be going through on the basis of the symptoms he/she is showing and on the basis of the previous records of the diseases he/she had I had to complete an assignment where I was asked to predict the bucket in which the ball would fall by using the KNN algorithm. Since I was using MPages for developing the project I was asked to code in the same but to show the output I have coded the algorithm using ES6.

```
const k =3;

function onScoreUpdate(dropPosition, bounciness, size, bucketLabel) {
  outputs.push([dropPosition,bounciness,size,bucketLabel]);
}

function runAnalysis() {
  const [testSet,trainSet] = shuffleData()
  }
}

const knn = (data, point) => {
  return _.chain(data)
    .map(row => [distance(row[0],point),row[3]])
    .sortBy(row => row[0])
    .slice(0,k)
    .countBy(row => row[1])
    .toPairs()
    .last()
    .first()
    .parseInt()
    .value()
}

const distance = (pointA, pointB) => Math.abs(pointB - pointA);
 const shuffleData = (data,testCount) => {
   const shuffled = _.shuffle(data);
   const testSet = _.slice(shuffled,0,testCount);
   const trainSet = _.slice(shuffled,testCount);
   return [testSet,trainSet];
```

FIGURE 4.8: Sample code for Knn algorithm

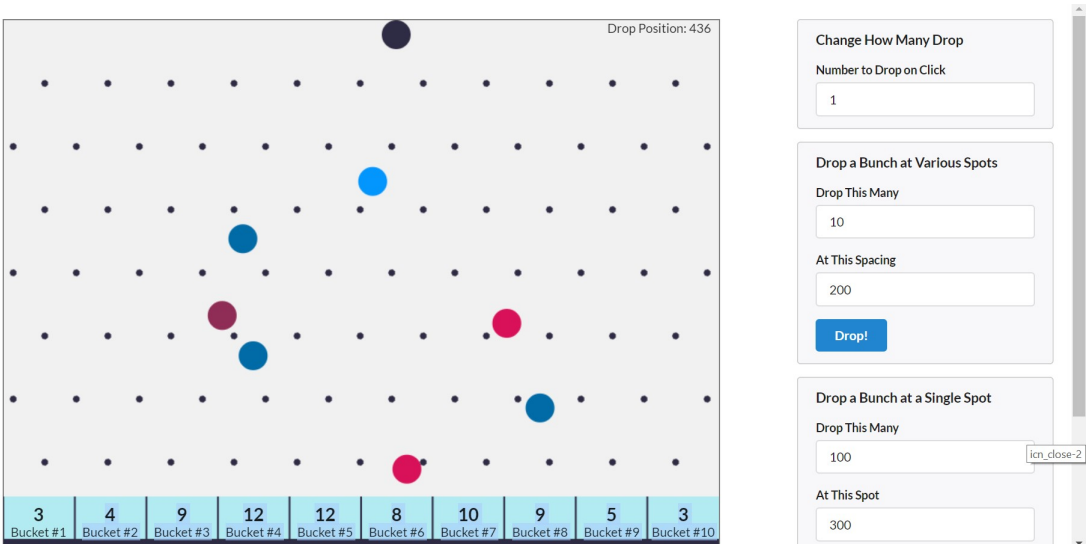


FIGURE 4.9: Balls prediction

4.2.4 Generation of static Content using CCL

Now the next step was to generate static content which can be then used for putting data into the our dashboard. We had to generate our own set of data as the hospitals wont disclose data of any patients as well as the doctors as it is the topmost concern of privacy and leakage of data could lead to a lot of problems. The initial step was to record data for 20 doctors and then to record data for patients and we had to consider 30-40 patients with different problems because then accordingly we had to train our modal for the same. We used Cerner command language for feeding the data into the database and then the same data is used when we load our dashboard. The static content gets stored on the device and the Gaia plugin then helps to point towards the static content for display.

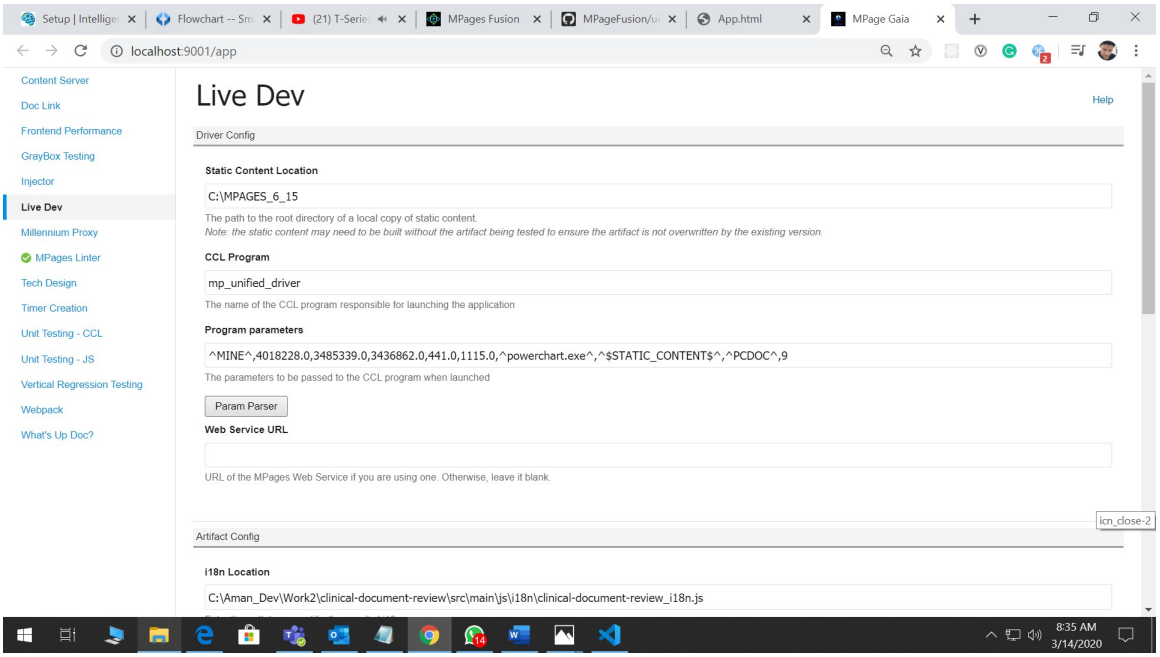


FIGURE 4.10: static content location being pointed

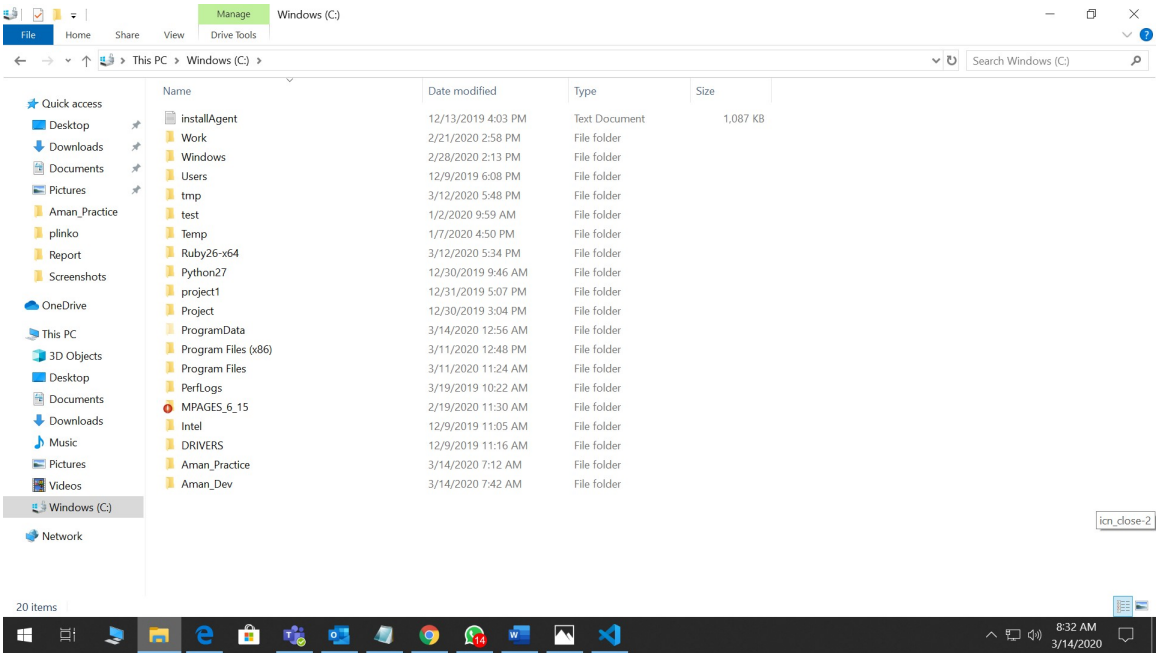


FIGURE 4.11: Static content

4.2.5 Creating an API and getting the data

Before the component starts loading first we need to create an API which gets hosted on the millennium and from there we can fetch the data from the API of the different doctors which gets displayed over in the component. We will be using Axios to fetch the data instead of normal HTTP request because Axios supports backward Compatibility and there is no need to specify the format in which the data needs to be received we directly get it in the json format.

```
import Axios from "axios";
import constants from "../constants/constants";

/**
 * Used to fetch Data from the BetterDoctor API
 * @returns Response which is in JSON format and if the data is not present it lo
gs an error
 */
const fetchDoctorData = () => {
    return new Promise((resolve, reject) => {
        Axios
            .get(constants.url)
            .then((response) => {
                resolve(response.data);
            })
            .catch((error) => {
                reject(error);
            });
    });
};
export default fetchDoctorData;
beforeCreate() {
        fetchDoctorData()
            .then((response) => {
                console.log(response);
                response.data.forEach((value, index) => {
                    this._doctorsTable.push({
                        key: "row".concat(index),
                        data: [
                            { display: value.profile.first_name },
                            { display: value.profile.title },
                            { display: value.specialties[0].uid }
```

FIGURE 4.12: Code for API call

```
                this._doctorsModal.push([
                    value.specialties[0].name,
                    value.specialties[0].description,
                    value.practices[0].location_slug
                ]);
            });
            this.setProp("isfetchDone", true);

this.getChild("doctorTable").setProp("rows", this._doctorsTable).update();
            this._sortter("column1", 1);
        })
        .catch(error => logger.logMessage(
            `Unable to fetch the data.Please contact your system admin. Error
details: ${error}`)
        );
    }
```

FIGURE 4.13: Code for API call

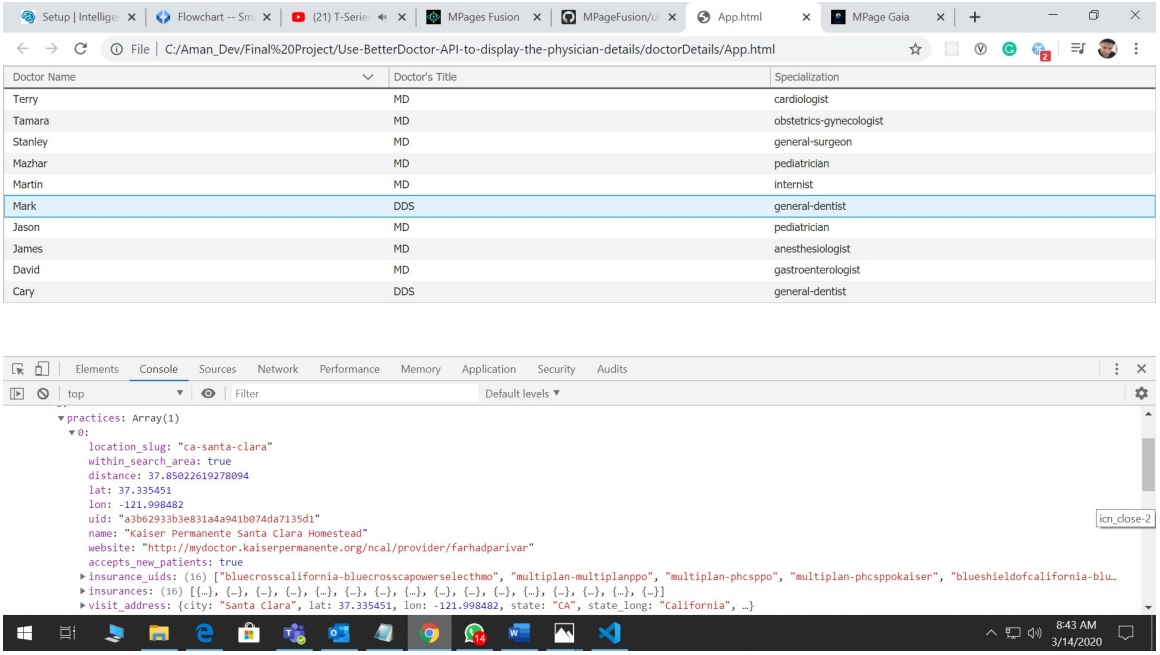


FIGURE 4.14: Doctor location being fetched directly from millenium

4.2.6 Symptom Prediction

Next Step is to predict the disease that the patient might be having based on the features being considered and using the same Knn algorithm as we had used in the prerequisites

for the project.

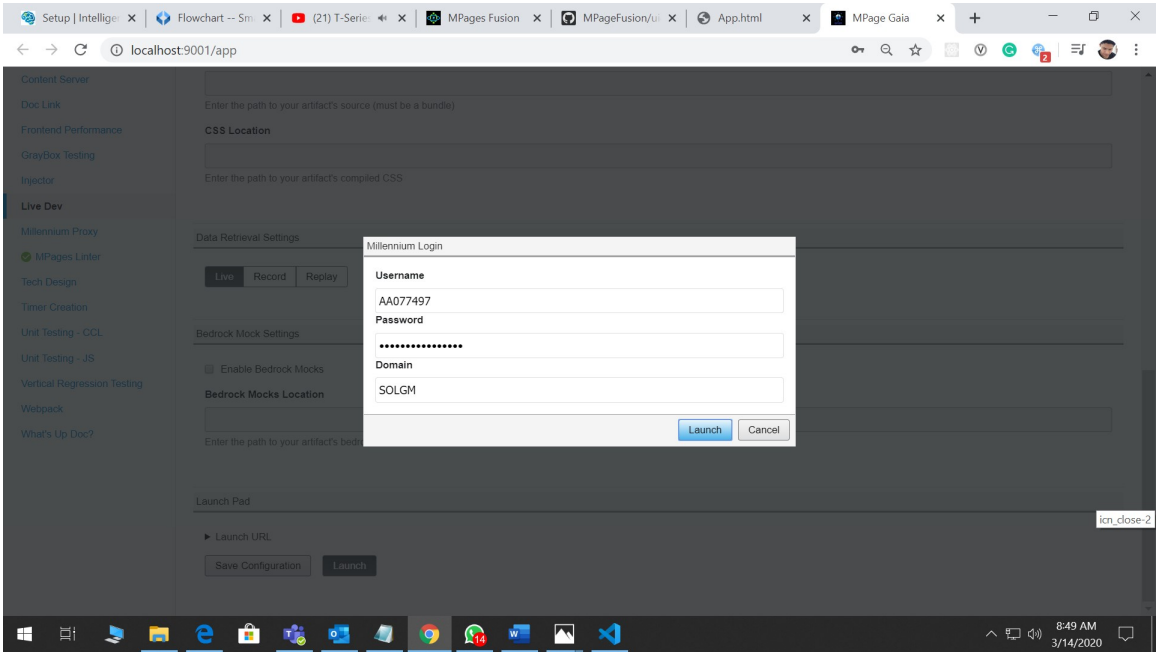


FIGURE 4.15: Login Credentials that doctors have to put in to sign into the millennium

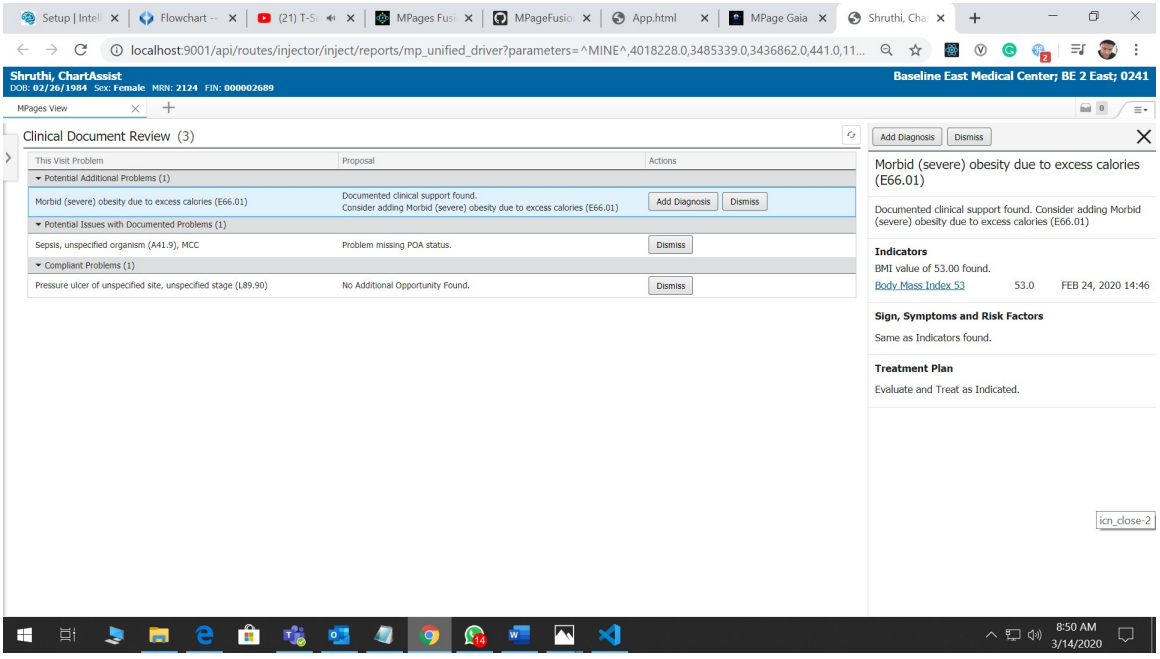


FIGURE 4.16: Disease being predicted by looking at the indicators, in this case it is Morbid as the BMI value found is 53.

4.3 Testing of the Component

Testing is an important job for DevOps since each components being created needs to be tested so as to fully make sure that it doesn't fail when launched to the client domain which could lead loss of money and reputation and could eventually lead to the company losing money on a large scale and even the project. The three testing which we perform at the developer domain are unit testing, integration testing and gray box testing. Unit tests are for testing logic and are not for testing UI. Do not append content to the DOM and verify against it in your specs. Always ensure your unit tests are fully functional before checking into trunk. If your unit tests are not functional when the next developer checks out the artifact, it will be your responsibility to fix any issues regardless of what you are currently working on.Keep future developers in mind when unit testing. Make sure your unit tests are clear, commented and structured so future developers will not have to spend time trying to understand your tests.When defining spies, place the definitions in the outermost beforeEach function. This will allow other developers to add to those shared spies instead of having to continually redefine spies. Code coverage should be 100Jasmine uses the titles you supply in the describe and it functions to produce a testing report. It is important that you establish a structure for your suites and specs so that future developers can easily integrate their new suites and specs and maintain a readable jasmine report.

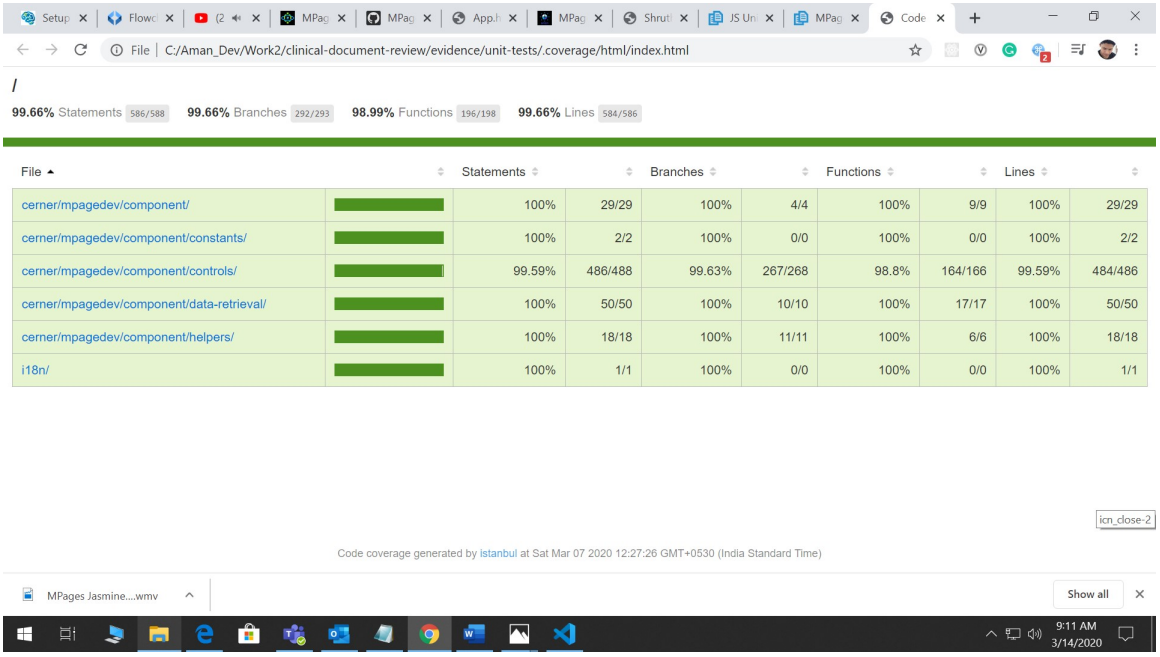
A good rule of thumb for creating a good spec layout is to read through the code and each time your code performs a particular action, you can create a small spec associated to that action. In the code snippet below we can see that the constructor for the Allergy-ComponentWF performs some very specific actions. For each of those actions we have a spec. This example is very granular as it is testing a constructor and the default values applied, but the spec describes exactly what the code is doing. When creating specs for your code you can choose to group blocks of logic in a spec as they make sense as was done with the AllergyComponent.openTab function.

Sample Code describe(”Allergy O2 component”, function()

describe(”The AllergyComponentWFStyle constructor”, function() it(”initializes the namespace of the styles object to ’wfal’”, function()););

describe(”The AllergyComponentWF constructor”, function()
it(”sets the criterion object”, function());
it(”sets the style object for the component”, function());

it(”sets the component load timer name”, function())
it(”sets the component render timer name”, function())
it(”sets the flag to include line numbers in the header”, function());
it(”sets the encounter scope to search all encounters”, function());
it(”defaults the resultCount member variable to 0”, function()););



File	Statements		Branches		Functions		Lines	
cerner/mpagedev/component/	100%	29/29	100%	4/4	100%	9/9	100%	29/29
cerner/mpagedev/component/constants/	100%	2/2	100%	0/0	100%	0/0	100%	2/2
cerner/mpagedev/component/controls/	99.59%	486/488	99.63%	267/268	98.8%	164/166	99.59%	484/486
cerner/mpagedev/component/data-retrieval/	100%	50/50	100%	10/10	100%	17/17	100%	50/50
cerner/mpagedev/component/helpers/	100%	18/18	100%	11/11	100%	6/6	100%	18/18
i18n/	100%	1/1	100%	0/0	100%	0/0	100%	1/1

FIGURE 4.17: Code Coverage.

describe(”The openTab function”, function() it(”calls APPLINK with the link defined in the component”, function()););

describe(”The retrieveComponentData function”, function() it(”makes a call to the MPGE-TALLERGIES script to retrieve the patients allergies”, function()););

);

Integration testing is basically done so as to combine all the components being developed by the team members so as to combine all the components and check whether they fail or not when working together. Graybox tests are nothing but functional test written via code. Graybox tests are written to test workflows that can be blackbox tested but the reason we write code to test; these workflows is that we should be able to automate these tests in the future to avoid added manual work each time we release. For each identified major workflow a folder is created under tests/graybox/workflows/ folder. If your new workflow is a subset of already identified majorworkflows new scenarios will

be created. Different scenarios are decided upon depending on what session data and data replies the workflows depend on. For each workflow folder you there are two sub folders that are created: containers and scenarios. containers depending on the react containers have expectations and selectors under them.

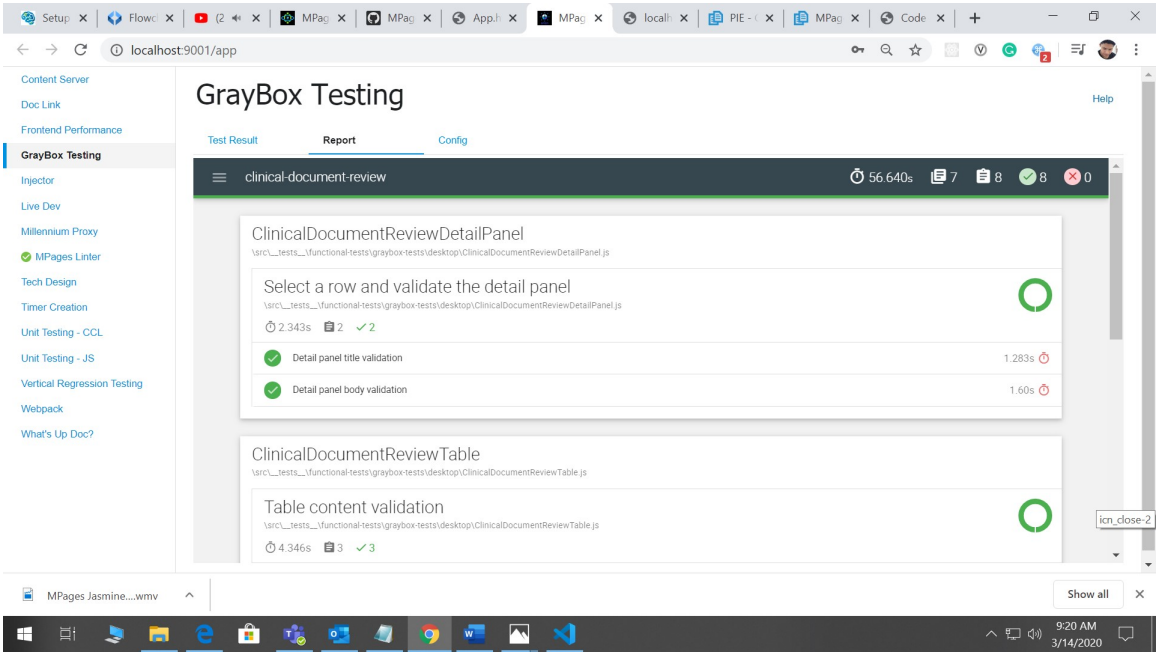


FIGURE 4.18: Graybox Testing of the component

Chapter 5

RESULTS, DISCUSSIONS AND CONCLUSIONS

As every project starts with a goal to establish, a problem to solve and to make existing projects better, they all lead to a result. These results helps us to determine whether the approach taken, job done, analysis and research conducted was correct and up to the mark or not. These results then help us to conclude what we have gained from all the hassle of researching, developing and testing.

5.1 Results & Analysis

If we do a deep analysis from where we started and where we are now, it can be found that that we started from the identification of the problem. We analyzed the methods in the health organization and then we moved on to find the problems with it. It was found that there are several problems existing in this field. We found out that lack of technologies being implemented in the healthcare domain leads to the wastage of resources and time as well and as we know even a single second is important as it is a matter of life and death when it comes to health. Ease of accessibility to doctors to patient data as well as keeping a track of all the doctors can help the management flourish with bright colors. Now to finally analyze our result we deploy the dashboard on the client domain and then perform validation testing to check if the data observed and the dashboard fulfills all the requirements as mentioned in the test design document. For doing this we first start with defining a view in bedrock and then with the help of

prefmaint we link the view to different view sources that are the tabs which display the different functionalities and then with the help of powerchart we define the components and the patient details and finally we can see the dashboard and then we can perform our validation tests .

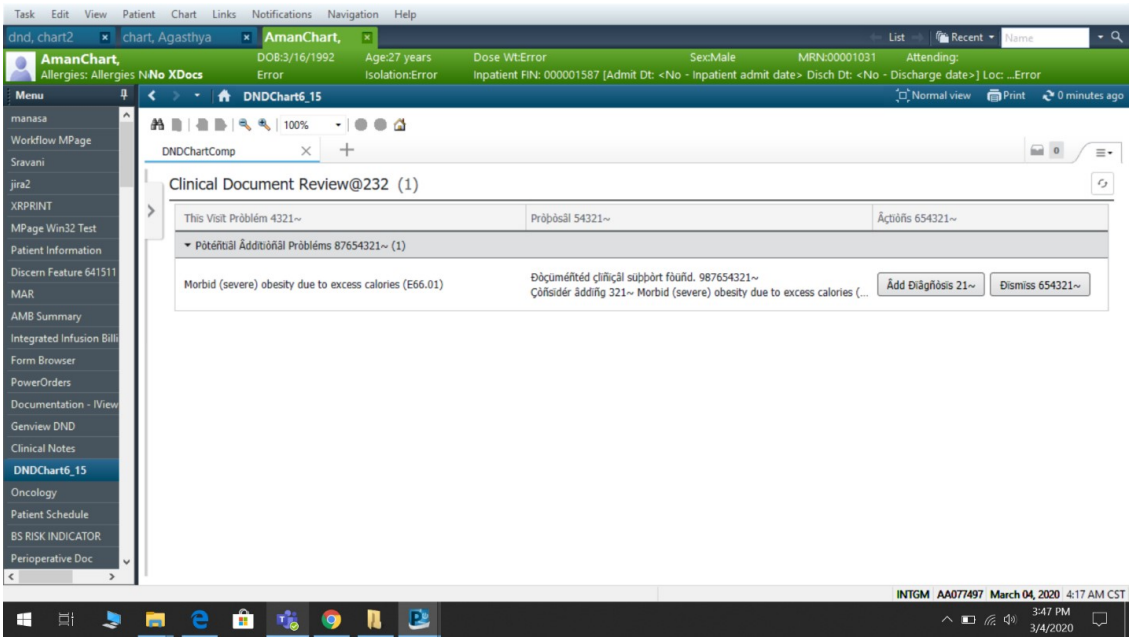


FIGURE 5.1: Physician Dashboard Component

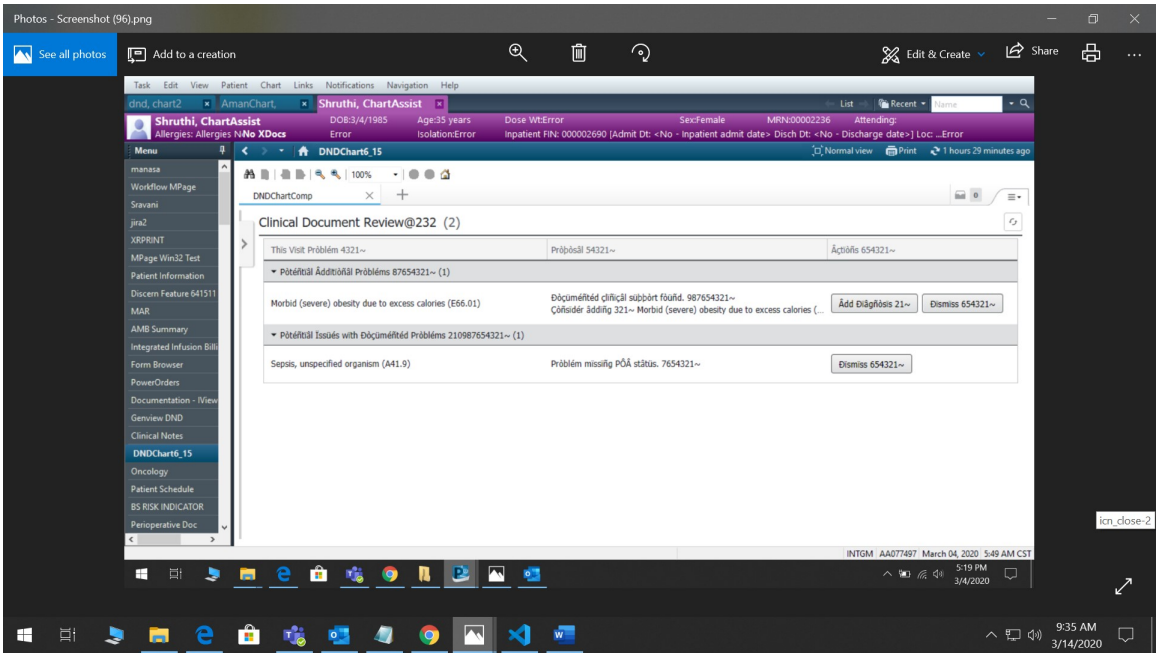


FIGURE 5.2: Dashboard with Shruthi's Data on display

5.2 Comparative Study

If we compare my project to the existing methods of managing patients and the workforce then we can clearly see some advantages. It is blatantly obvious that my project outperforms the manual mode in every way possible. If we see other manual system out there, they just offer simple check check out details of the personal, they don't have options to specifically configure it as well as the hit and trail meetings also take a lot of time because doctors are not machines and cannot remember everything, whereas physician dashboard comes with the features like time off , patient details, physician finder, shift configuration, booking calendar, liveness check and prediction of diseases and other plethora of features. In the leave management system the doctors easily configure the calendar, assign the leaves, specifically allocate the holidays and has many more features.
The solution to the problem and set of features in the product/project sets it apart from the existing products in the market.

5.3 Discussions

The project opens up a lot of topics for discussions. It opens up the possibility for us to discuss the the other features which can further be included to help the hospitals to manage their workforce in a proper way and save time so as to save the lives of the patients and also to make sure the physicians are attending the patients

5.4 Cost Estimation Model

For any new software project, it is necessary to know how much it will cost to develop and how much development time will it take. These estimates are needed before development is initiated. The company's cost estimation model is something which is confidential and hence cannot be shared.

5.5 Conclusions

Any project work is incomplete without concluding it from the results found, hence to conclude this project I can say that the internship I'm pursuing is of great help to me and is giving me the industry exposure that I desire. I achieved several of my learning goals and got insight into professional practices. Apart from this I also learned the different facets of a well established company and the process they follow when being assigned a project. I successfully learnt ES6,Mpages Framework,CCL,Jasmine Unit Testing,Gaia, Jenkins, Maven and other technologies like Selenium, TestProject, CI/CD etc. These areas brought out my strength and also the areas I needed to make up. The internship added more confidence to my professional approach, stronger positive attitude and how to work in a team as a team player. The primary objective of this internship was to gather real life working experience and put my theoretical knowledge into practice. In this internship period I'm developing a lot of confidence and courage in this industry and startup work culture. Apart from concluding that I have successfully learnt all these technologies and topics during my experiential learning and project building phase, I can also say that the project will overcome all the problems identified and discussed. It can also be concluded that the project will feature the concept of scalability and further features can be easily added since it follows a microservice architecture. During this internship phase, I thoroughly enjoyed the challenges that come along everyday. I learnt that this is just the beginning of the road and I've to travel a long distance to be a successful person in this field. But I must say that this experience will prove an objective in my career in this software field

5.6 Scope for Future Work

As organizations transform their approach to testing for advancing their digital transformation initiatives, the discipline of testing is additionally evolving at an unprecedented rate. Cloud, AI, machine learning, RPA and therefore the internet of things are undeniably impacting the longer term of testing — but so are legacy systems, regulatory compliance and security. Testing is designed for AI/ML to build predictable models from patterns. An AI bot creates log-in tests and then goes throughout the SDLC. Today CI/CD and streamlining long-term, this will be very commonplace. Using AI to run every test imaginable in the least amount of time

Even the whole revolutionalization is happening due to which all the technologies will be shifting to cloud computing which will save time and resources at the same time and could lead to better approach to tackle problems such as system crashes due to intensive processing an so on.

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Appendix A

Technologies Used

Technology is the sum of techniques, skills, methods, and processes used in the production of goods or services or in the accomplishment of objectives, such as scientific investigation. Technology can be the knowledge of techniques, processes, and the like, or it can be embedded in machines to allow for operation without detailed knowledge of their workings. Systems (e.g. machines) applying technology by taking an input, changing it according to the system's use, and then producing an outcome.

A.1 Mpages Framework

Mpage is a fusion framework which is a combination of mithril.js ,babel , selenium and many more thing. It could be thought of as React Js but lot more features and kind of same life cycle method but different approach and UI setups. The UIComponent is the base class from which all visual components will inherit. It contains various lifecycle methods that are intended to be overwritten by the control that is implementing a UIComponent. It also contains various helper functions when dealing with child UIComponents and handling events. The UIComponent class has explicit lifecycle methods that can be overridden or used to achieve the desired functionality of a particular control. There are four distinct sections in the UIComponent lifecycle.

Construction
Render
Update
Destruction

A.2 CCL

The Cerner Command Language (CCL), also known as Discern Explorer, is a scripting language intended to facilitate access to information stored within the Millennium database and information about the current Millennium environment and domain. It is often described as a hybrid of C-like syntax and PL/SQL-like syntax.
If you need a lightweight, easily-compiled, and easily-deployed program to access or manipulate information within a Millennium domain, a CCL script is one available choice. Its runtime environment is provided as part of a Millennium installation and requires little to no configuration on the part of someone wishing to use it - a connection to the database is readily available, and information about the current environment and domain is expressed through reserved variables and User Access Routine (UAR) functions.

A.3 Jasmine

Jasmine is a behavior-driven development framework for testing JavaScript code. It does not depend on any other JavaScript frameworks. It does not require a DOM. And it has a clean, obvious syntax so that you can easily write tests.

A.4 Tensorflow.js

Tensorflow.js is a new method of incorporating machine learning with Mpages framework where we can make use of the inbuilt functions written in ES6 and does not require python usage. Develop ML models in JavaScript, and use ML directly in the browser or in Node.js.

A.5 ES6

ES6 also known as EcmaScript is the new way of coding in javascript which brings in a ton of features like promises,destructuring and so on. It is still prefered over ES5 as function need not be completed immediately and can be resolved later as well.

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